IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s): David E. Clune et al.
Case: Clune 3-4-18
Serial No.: 10/037,067
Filing Date: December 21, 2001
Group: 2143
Examiner: George C. Neurauter

Title: Method and Apparatus for Maintaining Multicast Lists in a Data Network

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APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants (hereinafter "Appellants") hereby appeal the final rejection dated September 22, 2006 of claims 1-11 and 13-15 of the above-identified application.

REAL PARTY IN INTEREST

The present application is assigned of record to Agere Systems Inc. On April 2, 2007, the assignee Agere Systems Inc. completed a merger with LSI Logic Corporation, with the resulting entity being named LSI Corporation. LSI Corporation is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences.

STATUS OF CLAIMS

The present application was filed on December 21, 2001 with claims 1-15. Claims 1-11 and 13-15 remain pending. Claims 1, 14 and 15 are the pending independent claims.

Each of claims 1-11 and 13-15 stands rejected under 35 U.S.C. §103(a). Claims 1-11 and 13-15 are appealed.

STATUS OF AMENDMENTS

There have been no amendments filed subsequent to the final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a method for identifying destination nodes of a multicast session in a network having a plurality of nodes. The method includes steps of forming a circularly linked list further comprising a list of destination nodes, each destination node having an associated destination address for receiving multicast data and a link to a next destination node in the list for processing; entering the list at an initial destination node; traversing the linked list to process each destination node, for each destination node, sending the multicast data to the associated destination address and using the link to determine the next destination node for processing; and terminating the traversing step when all linked destination nodes have been processed.

With reference to FIG. 4 of the drawings, the recited step of forming a circularly linked list may be step 22, discussed in the specification at, for example, page 9, lines 3-8. The step of entering the list at an initial destination node may be step 23, discussed in the specification at, for example, page 9, lines 8-10. The step of traversing the linked list may comprise steps 28 and 29, as discussed in the specification at, for example, page 9, lines 13-21. The step of terminating the traversing step may comprise steps 28 and 30, as discussed in the specification at, for example, page 9, lines 21-24.

With reference to FIG. 3 of the drawings, examples of the recited circularly linked list and initial destination node may be seen in A and A1, respectively (see the specification at, for example, page 6, lines 12-14 and at page 7, lines 3-6, respectively), or in B and B5, respectively

(see the specification at, for example, page 6, lines 12-14 and at page 9, lines 25-27, respectively). Examples of the application of the claimed steps to the exemplary circularly linked lists A and B are provided in the specification at page 7, lines 3-15, and page 9, line 25, to page 10, line 5, respectively.

Independent claim 14 is also directed to a method for identifying the destination nodes for a multicast session in a network having a plurality of nodes. The method includes steps of forming a multicast group list comprising a queue further comprising a circularly linked list of destination nodes, wherein each destination node includes link information and an associated destination node address for receiving multicast data; receiving data intended for transmittal to the destination nodes of the multicast session; entering the list at an initial destination node as determined from the received data; traversing the list according to the link information of each destination node in the list and sending the multicast data to the associated destination node address for each destination node in the list; determining when the traversing step returns to the initial destination node entry; and terminating the traversing step in response to the step of determining.

With reference to FIG. 4 of the drawings, the recited step of forming a multicast group list may be step 22, discussed in the specification at, for example, page 9, lines 3-8. The step of receiving data intended for transmittal is discussed in the specification at, for example, page 6, lines 15-17. The step of entering the list at an initial destination node may be step 23, discussed in the specification at, for example, page 9, lines 8-10. The step of traversing the linked list may be step 29, as discussed in the specification at, for example, page 9, lines 13-16 and 18-21. The step of determining when the traversing step returns to the initial destination node entry may be step 28, as discussed in the specification at, for example, page 9, lines 16-18. The step of terminating the traversing step may be step 30, as discussed in the specification at, for example, page 9, lines 21-24.

With reference to FIG. 3 of the drawings, examples of the recited multicast group list and initial destination node may be seen in A and A1, respectively (see the specification at, for example, page 6, lines 12-14 and at page 7, lines 3-6, respectively), or in B and B5, respectively (see the specification at, for example, page 6, lines 12-14 and at page 9, lines 25-27,

respectively). Examples of the application of the recited steps to the exemplary multicast group lists A and B are provided in the specification at page 7, lines 3-15, and page 9, line 25, to page 10, line 5, respectively.

Independent claim 15 is directed to an apparatus for identifying destination nodes of a multicast session in a network having a plurality of nodes. This apparatus comprises a circularly linked list further comprising a list of destination nodes, wherein the contents of each destination node includes an associated destination node address, list linking information and data transmission parameters; and a processing engine for identifying an initial destination node for entering the list. The processor engine also performs the process of traversing the linked list according to the list linking information until the initial destination node entry is reached, at each destination node the processing engine sending multicast session data to the associated destination node address according to the data transmission parameters. The processor engine also terminates the traversing process.

With reference to FIG. 3 of the drawings, examples of the recited multicast group list and initial destination node may be seen in A and A1, respectively (see the specification at, for example, page 6, lines 12-14 and at page 7, lines 3-6, respectively), or in B and B5, respectively (see the specification at, for example, page 6, lines 12-14 and at page 9, lines 25-27, respectively).

With reference to FIG. 5 of the drawings, the recited apparatus may be network processor 31 and the recited processing engine may be processing engine 36. The destination node addresses to which the packets are sent may be the multicast group members 34.

With reference to FIG. 4 of the drawings, the process of entering the list at an initial destination node may be step 23, discussed in the specification at, for example, page 9, lines 8-10. The process of identifying an initial destination node for entering the list may be step 23, discussed in the specification at, for example, page 9, lines 8-10. The process of traversing the linked list may comprise steps 28 and 29, as discussed in the specification at, for example, page 9, lines 13-21. The process of terminating the traversing process may comprise steps 28 and 30, as discussed in the specification at, for example, page 9, lines 21-24.

The claimed invention provides a number of significant advantages over conventional arrangements. See the specification at, for example, page 3, lines 14-20, and page 4, line 25, to page 5, line 19.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-11 and 13-15 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,219,352 (hereinafter "Bonomi") in view of Donald E. Knuth, The Art of Computer Programming (2d ed. 1973) (hereinafter "Knuth").

ARGUMENT

Claims 1-3, 7, 8, 10, 11, 13 and 15

The Examiner's argument that the combination of Bonomi and Knuth teaches the limitations of claim 1 regarding the use of a circularly linked list is based on his contention, found on page 5 of the final Office Action, that although "Bonomi does not expressly disclose a circularly linked list, however, it would have been obvious to modify the teachings of Bonomi use [sic] a circularly linked list as disclosed in Knuth for the reasons disclosed in Knuth and as is well known in the art by those of ordinary skill."

Appellants respectfully submit that the proffered motivation for combining or modifying the combination of Bonomi and Knuth is deficient. The Federal Circuit has stated that when patentability turns on the question of obviousness, the obviousness determination "must be based on objective evidence of record" and that "this precedent has been reinforced in myriad decisions, and cannot be dispensed with." In re Sang-Su Lee, 277 F.3d 1338, 1343 (Fed. Cir. 2002). Moreover, the Federal Circuit has stated that "conclusory statements" by an examiner fail to adequately address the factual question of motivation, which is material to patentability and cannot be resolved "on subjective belief and unknown authority." Id. at 1343-1344.

Appellants contend that, rather than providing motivation for combination with Bonomi, Knuth merely recites some general advantages of a circularly linked list as an abstract data type; see, for example, the statement on page 270 that "a circular list . . . has the property that its last node links back to the first instead of to Λ. It is then possible to access all of the list starting at

any given point; we also achieve an extra degree of symmetry, and if we choose we need not think of the list as having a 'last' or 'first' node." Nowhere does Knuth teach or even suggest the use of a circular linked list for storage of multicast groups. This is unsurprising in light of the fact that Knuth, as cited by the Examiner, is a 1973 revision of a 1968 book, whereas the concept of multicast groups in the Internet Protocol context was not proposed until more than a decade later. See, for example, D.R. Cheriton & S.E. Deering, IETF RFC 966: Host Groups: A Multicast Extension for Internet Protocol, December 1985, http://tools.ietf.org/html/rfc966.

Appellants further contend that Examiner's statement that the modification would have been obvious "as is well known in the art by those of ordinary skill" is precisely the sort of conclusory statement addressed by MPEP 2143.01(iv), which states as follows, with emphasis supplied:

> A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See also *In re Kotzab,* 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (Court reversed obviousness rejection involving technologically simple concept because there was no finding as to the principle or specific understanding within the knowledge of a skilled artisan that would have motivated the skilled artisan to make the claimed invention); *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 USPQ2d 1161 (Fed. Cir. 1999) (The level of skill in the art cannot be relied upon to provide the suggestion to combine references.).

It should be noted that the techniques disclosed in the present application have a number of advantages over the conventional methods disclosed in Bonomi, as discussed in Appellants' specification at, for example, page 8, lines 21-30:

> The use of a circular multicast list according to the present invention significantly reduces the memory storage requirements at the network processor, as compared with the prior art. Only a single circularly linked list is required for each multicast group, with the entry point determining the group member to skip or

> omit from the group for the multicast session. In the prior art, each multicast group list is linearly linked and therefore must be replicated a number of times equal to the number of entries in the list, with each list replication omitting one group member, which does not receive a copy of the multicast packet.

Appellants note that Bonomi was filed in 1997 and Knuth published in 1973. Appellants respectfully submit that the failure of other researchers in this field of endeavor to render the allegedly obvious invention disclosed in the present application during the long period during which both references were publicly available and well known to those skilled in the art constitutes objective evidence of non-obviousness and only further lends support for the patentability of the present invention.

More generally, these other researchers have presumably been aware of the existence of both circularly linked lists and multicast groups for at least two decades, since the introduction of the above-cited RFC 966 reference in 1985. One cannot help but wonder why these other researchers have heretofore failed to use a circularly linked list for multicast groups, despite the considerable advantages that Appellants have determined result from such an arrangement. The answer is that these other researchers, although presumably aware of the existence of both circularly linked lists and multicast groups, never thought to put the two separate ideas together in the manner disclosed by Appellants, and hence have been unable to achieve the associated advantages. In formulating the §103(a) rejection, the Examiner is using improper hindsight, based on the benefit of access to the disclosure of Appellants, to make a connection that those skilled in the art have clearly been unable to make.

Appellants further contend that, even if one were somehow motivated to combine Bonomi and Knuth, it is unclear in what manner one would combine the abstract data type disclosed in Knuth and the conventional multicasting technique disclosed in Bonomi so as to reach the specific steps of the claimed method without engaging in undue experimentation.

In the Advisory Action dated January 25, 2007, the Examiner argues that he established a proper *prima facie* case of obviousness in the final rejection. Appellants respectfully submit that this alleged *prima facie* case is deficient as the Examiner has failed to provide a proper motivation to combine Bonomi and Knuth, as discussed above. Furthermore, Bonomi teaches

away from the proposed combination by teaching the use of conventional multicast lists rather than the claimed circular linked lists.

Furthermore, even if one were to assume for purposes of argument that the Examiner has established a proper *prima facie* case of obviousness, Appellants respectfully submit that there is sufficient evidence of nonobviousness so as to rebut any such *prima facie* case. For example, the fact that others have used a less advantageous technique, rather than combining the separate but well-known techniques disclosed in the cited references, suggests both a long-felt need and failure of others.

Independent claim 15 includes limitations similar to those of claim 1, and is therefore believed allowable for reasons similar to those described above with reference to claim 1.

Dependent claims 2, 3, 7, 8, 10, 11 and 13 are believed allowable for at least the reasons identified above with regard to claim 1.

Claim 4

Dependent claim 4 recites a limitation wherein at least one destination node of the list, as determined from the received data, is excluded from the multicast list. In formulating the rejection, the Examiner relies on column 14, lines 17-25 of Bonomi. Appellants respectfully submit that the relied-upon portion of Bonomi fails to disclose the recited limitation. Instead, this portion discloses removing entries from a list as each cell is transmitted rather than excluding a node from the list. Furthermore, the node to be excluded is based on solely on the transmitted data, rather than the received data. See Bonomi at column 14, lines 17-25: "As a cell is transmitted on a port, scheduler 470 updates the corresponding port mask entry to reflect that the cell does not need to be transmitted on that port. Once all the entries of a port-mask equal zero, the corresponding cell data is no longer needed. . . . [and] the corresponding storage location available for newly arriving cells." Accordingly, it is believed that the proposed combination of Bonomi and Knuth fails to meet the limitation in question.

Claim 5

Dependent claim 5 includes a further limitation wherein the received data includes an indicator identifying the destination node that is to be excluded from the multicast session. In formatting the rejections of claim 5, the Examiner relies on column 14, lines 17-25 of Bonomi. This portion, quoted above, fails to even mention the received data, much less disclose that the received data includes an indicator identifying the destination node that is to be excluded from the multicast session. Accordingly, it is believed that the proposed combination of Bonomi and Knuth fails to meet the limitation in question.

Claim 6

Dependent claim 6 includes a further limitation wherein the received data includes an indicator which identifies the destination node from which the data was received as the destination node to be excluded from the multicast session. In formatting the rejections of claim 6, the Examiner relies primarily on column 14, lines 17-25 of Bonomi. This portion, quoted above, fails to even mention the received data, much less disclose that the received data includes an indicator which identifies the destination node from which the data was received as the destination node to be excluded from the multicast session. The Examiner also cites column 2, lines 45-67 of Bonomi. Appellants contend that although this section discloses that multicast refers to the ability of one source end-station to send a cell to several target end-stations, it contains no suggestion that the source end-station need be, or even should be, excluded from the list of target end-stations. Accordingly, it is believed that the proposed combination of Bonomi and Knuth fails to meet the limitation in question.

Claim 9

Claim 9 recites a limitation wherein an address for entering a list is the destination node from which the data is entered. In formulating this rejection, the Examiner relies upon Bonomi at column 10, lines 12-60 and column 11, lines 18-47. Appellants submit that Bonomi not only fail to disclose the claimed limitation but in fact teaches away by instead teaching that the ordering of cells within a queue is based on cell order, i.e., a conventional FIFO ordering. See

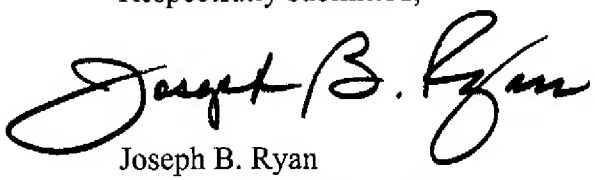
Bonomi at column 13, lines 1-16. Accordingly, the address for entering the list is the first element of the queue, which in turn is based on time of receipt rather than the node from which the data is entered. Thus, the proposed combination of Bonomi and Knuth fails to meet the limitation in question.

Claim 14

Appellants contend that the arguments previously presented with regard to independent claims 1 and 15 are equally applicable to independent claim 14, which is likewise rejected based on the combined teachings of Bonomi and Knuth. Appellants further submit, however, that claim 14 includes a limitation similar to that of claim 9, and is thus further believed patentable for reasons similar to those identified above with regard to claim 9.

In view of the above, Appellants believe that claims 1-11 and 13-15 are in condition for allowance, and respectfully request the withdrawal of the §103(a) rejection.

Respectfully submitted,



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CLAIMS APPENDIX

1. A method for identifying destination nodes of a multicast session in a network having a plurality of nodes, comprising:

forming a circularly linked list further comprising a list of destination nodes, each destination node having an associated destination address for receiving multicast data and a link to a next destination node in the list for processing;

entering the list at an initial destination node;

traversing the linked list to process each destination node, for each destination node, sending the multicast data to the associated destination address and using the link to determine the next destination node for processing; and

terminating the traversing step when all linked destination nodes have been processed.

2. The method of claim 1 further comprising receiving data intended for transmittal to the identified destination nodes of the multicast session.

3. The method of claim 2 wherein the initial destination node is determined from the received data.

4. The method of claim 2 wherein at least one destination node of the list, as determined from the received data, is excluded from the multicast session.

5. The method of claim 4 wherein the received data includes an indicator identifying the destination node that is to be excluded from the multicast session.

6. The method of claim 5 wherein the indicator identifies the destination node from which the data was received as the destination node to be excluded from the multicast session.

7. The method of claim 1 wherein the initial destination node is predetermined.

8. The method of claim 1 further comprising receiving data intended for transmittal to the identified destination nodes of the multicast session on an input port, and wherein the initial destination node is determined based on the input port.

9. The method of claim 1 wherein the address for entering the list is the destination node from which the data was received.

10. The method of claim 1 wherein the traversed destination nodes are the identified destination nodes of the multicast session.

11. The method of claim 1 wherein destination nodes for a plurality of multicast sessions are interleaved in the list, and wherein the destination nodes for each one of the plurality of multicast sessions are circularly linked.

12. (Canceled)

13. The method of claim 11 wherein the link comprises a pointer at each destination node that points to another destination node such that the plurality of destination nodes are circularly linked.

14. A method for identifying the destination nodes for a multicast session in a network having a plurality of nodes, comprising:

forming a multicast group list comprising a queue further comprising a circularly linked list of destination nodes, wherein each destination node includes link information and an associated destination node address for receiving multicast data;

receiving data intended for transmittal to the destination nodes of the multicast session;

entering the list at an initial destination node as determined from the received data;

traversing the list according to the link information of each destination node in the list and

sending the multicast data to the associated destination node address for each destination node in the list;

determining when the traversing step returns to the initial destination node entry; and

terminating the traversing step in response to the step of determining.

15. An apparatus for identifying destination nodes of a multicast session in a network having a plurality of nodes, comprising:

a circularly linked list further comprising a list of destination nodes, wherein the contents of each destination node includes an associated destination node address, list linking information and data transmission parameters;

a processing engine for identifying an initial destination node for entering the list and for traversing the linked list according to the list linking information until the initial destination node entry is reached, at each destination node the processing engine sending multicast session data to the associated destination node address according to the data transmission parameters; and

the processing engine terminating the traversing process.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None